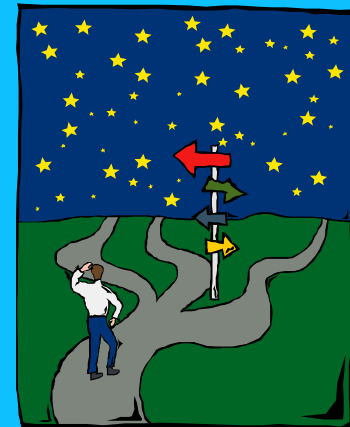


Why a Robotics⁺VR+Sims Center?

The field of Robotics offers a variety of potential growth areas through the space program that can be developed in the US economy. Robotics offers a close association with disciplines in virtual reality, controls, simulation, and other technical fields that will prove invaluable to space development and also offer tremendous economic potential.

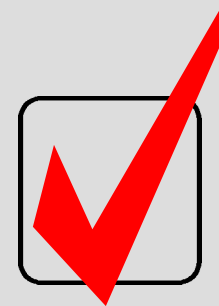
IEEE uses the following text to publicize it's ICRA2000 conference on Robotics and related technologies:

“At the dawn of the new millennium, robotics is undergoing a major transformation in scope and dimension. From a largely dominant industrial focus, robotics is rapidly expanding into the challenges of unstructured environments. Interacting with, assisting, serving, and exploring with humans, the emerging robots will increasingly touch people and their lives. These advances in intelligent machines will impact a wide range of areas in manufacturing, space, underwater, services, health care, disaster prevention, waste management, entertainment, product design, and remote intervention among others.”



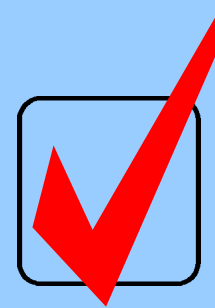
Is There Commercial Potential?

- There is clearly potential in a number of areas involving robotics, telerobotics, telecontrol, virtual reality, simulations, and other techniques. The opportunities appear in a wide variety of areas, including:
 - Humanoids to serve as substitutes for humans in severe environments. Humanoids appear to have NASA and commercial potential in various roles in which direct human presence can be augmented by human-like devices.
 - Human Assist Devices for the Handicapped and Impaired.
 - Intelligent Robotics which adapt to changing conditions and situations involving human interface.
 - Inspection and testing robotics, simulations, and controls.
 - Telerobotics. Exploration and security enhancement.
 - Manufacturing Simulations, Controllers, Robotics.
 - Education. VR simulations for teaching, including Newton's World, Pauling's World, Etc.
 - Entertainment.
 - ETC...



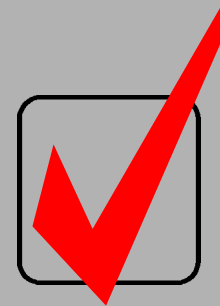
Are There Benefits for NASA?

- NASA now has a variety of elements doing R&D on different types of robotics, telerobotics, telecontrol, virtual reality simulations, and other related activities. A Commercial Space Center could serve to:
 - Better Focus NASA efforts across the Agency
 - Maximize Resources and Investments
 - Facilitate More relationships among NASA, Academia, and industrial partners with similar interests
 - Allow NASA insight into activities ongoing in industry and academia which may be applied to NASA activities.



Will Access to Space Contribute to the Success of Such a Center?

- Robotics and automation can advance space projects in countless ways. One of the resources most precious on orbit is crew time. Devices which can utilize crew time most effectively are of extreme value in space activities.
- Humanoids can have an extremely valuable role in human exploration and occupation of space vehicles. The testing and calibration of such devices in space is critical to designing and manufacturing space-functional machines, and will prove extremely valuable in the design of earth-functional machines.
- Robots can be invaluable in inspection and repair functions, and can serve in staging and closure activities for tasks which require direct human participation such as EVAs.
- There are any, many other applications which can be improved by advancing technology in these areas.



Process Overview

Rev.
04/20/00

Single-Stage Procurement

- **Fall 1999:** Research & Development of Concepts; Narrowing of field. 90 Days ☒ Complete
- **Winter '99 - Spring '00:** Additional Research and contacts with NASA organizations, academia, industry, and industrial trade organizations to gage interest levels. 90 Days ☒ Complete
- **April - June 2000:** Participate in conferences, build and document industrial and academic interest through Web Survey 90 Days ☒ Working
- **April - June 2000.** Build NASA Partners index, evaluation and selection criteria, organize evaluation and selection committee 90 Days ☒ Working
- **July - September 2000:** *Submit documentation for NASA HQ review & input; participate in NASA HQ Review. Duration TBD.* 90 Days ☐
- **October - November 2000.** Advertise NRA Solicitation. 45 - 60 Days ☐
- **December - February 2000.** Receive and Evaluate Proposals. 90 Days ☐
- **March - April 2001.** Award Base Grant to Establish Commercial Space Center (or other form of organization). Accomplish SPD Program goal of additional CSC. 90 Days ☐
- **April 2001 - September 2001.** First Fiscal Year of Operation. ☐

Evaluate and Selection Process

- Solicitation for Proposals. Designed to encourage and reward innovative and creative methods of developing and producing technical products and services.
- Elements. Proposal format will resemble business plan. Will require:
 - Executive Summary
 - Proposed Team Structure
 - Proposed Team Strategy , Including NASA Participation and Utilization of NASA Access to Space, Expertise, Facilities, or Other Resources
 - Summary Analysis of the Specific Business Environment
 - Proposed Products, Services, and Focus Areas
 - Development and Market Strategy
 - Financial Strategy, Including NASA & Non-NASA Funding Sources
 - Action Plan
- Evaluation Method. A published scale will be utilized to score proposals.
- Evaluation Team. A team of evaluators representing a cross-section of NASA centers and expertise will review proposals and provide input & recommendations. The team *may* include:
 - Dr. Neville Marzwell, JPL
 - Mr. Robert Savely, JSC
 - NASA HQ Representative
 - Mr. Mark Nall, MSFC
 - Dr. Steve Zornetzer, ARC
 - TBD

Web Survey

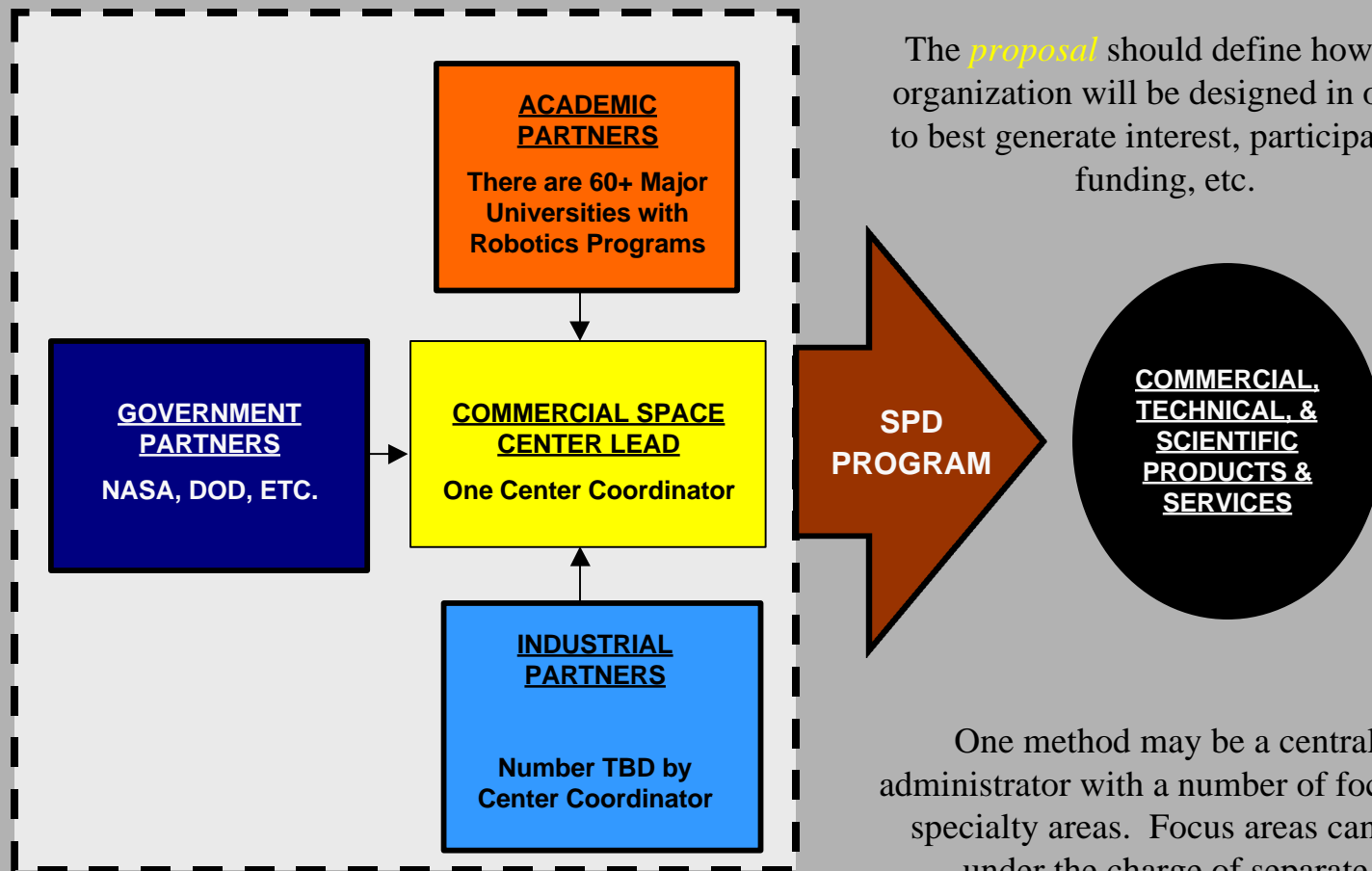
Web Address: <http://ntf-1.msfc.nasa.gov/robotics.nsf>

- **Solicit and Document Interest Levels.** Web site is designed to solicit and document input from potential participants in a new center. To be posted approximately 04/10.
- **Linked to Existing Sites.** The web site will be linked to the existing SPD.NASA.Gov site. Sites will be referenced during the upcoming IEEE International Conference on Robotics and Automation (ICRA2000). Surveys will also be electronically to as many academic and industrial contacts as can be generated
- **Information Has Multiple Uses.** Information to be harvested will be utilized to increase inter-organizational contact.

The screenshot shows a web browser window displaying a survey titled "SPACE COMMERCIALIZATION". The survey is hosted on a NASA website. It includes a sidebar with a list of links and a main content area with a form. The form has fields for "First Name", "Last Name", "Organization", "Organization Type", "Title", "Address Line 1", "Address Line 2", "City", "State", "Zip", "E-mail Address", and "Phone Number". Below the form, there is a section titled "The questions below are designed to provide NASA with information to characterize your organization." and a question: "1. What is your area of expertise? Examples: 'Humanoid robotics to assist the disabled', 'Telemedicine', 'Virtual Reality Simulations', etc."

The screenshot shows the continuation of the survey form. It includes a section titled "Questions Regarding Funding" with a paragraph: "One of the objectives of the NASA Commercial Space Products Development Program is to generate investment by other sources to further advance research, development, and the commercial availability of products and services." Below this, there is a question: "7. What strengths does your organization offer to a new Commercial Space Center relative to enhancing the ability to generate investment in research and development of products and services for the commercial market? Example: 'We are a non-profit institution with a well-developed network of industrial partners.'" and a text input field. Below the input field, there is a section titled "Further Contact" with a question: "8. Would you like to receive additional detailed information defining the potential new center?" and a question: "9. What is the best method of contacting you?" with radio buttons for "E-Mail", "Regular Mail", and "Telephone". At the bottom, there are "Submit Form" and "Quit Form" buttons.

How Might the Center to be Organized?



The *proposal* should define how the organization will be designed in order to best generate interest, participation, funding, etc.

One method may be a central administrator with a number of focus or specialty areas. Focus areas can be under the charge of separate organizations.

Potential Academic Participants

There are approximately **60 universities** across the United States that have some type of robotics endeavor. These universities include some of the foremost engineering institutions in the United States, including Stanford, Vanderbilt University, Boston University, Caltech, Carnegie Mellon, Cornell, Georgia Tech, UC Berkley, Harvard, MIT, and many others.

Web Sites and Links can be viewed at:

<http://robotics.jpl.nasa.gov/people/welch/other-robotics.html>

One potential structure for a Commercial Space Center may be to have one defined administrative leader and a small core of leading participants. Stanford may, for example, provide administrative leadership and a facet of technical R&D, while utilizing various other academic and industrial organizations for lead roles in a defined area (such as MIT, Cal Tech, Oceaneering, Etc..).

What Are Some Potential Focus Areas?

- Humanoids to serve as **substitutes for humans** in severe environments. Humanoids appear to have NASA and commercial potential in various roles in which direct human presence can be augmented by human-like devices.
- **VR simulations** for industry, education, etc.
- **Human Assist Devices** for the Handicapped and Impaired.
- **Intelligent Robotics** which adapt to changing conditions and situations involving human interface.
- **Inspection and testing** simulations, automation, and robotics.
- **Telerobotics**. Exploration and security enhancement.
- **Manufacturing** Simulations and Robotics.
- **Education**.
- **Entertainment**.
- ETC...